19

WO 2005/081646 PCT/KR2005/000525

Claims

[1] A solvent-free polymer electrolyte comprising:

a porous film having a first surface and a second surface, the porous film comprises a reticulated network of channels formed between pores on the first and second surfaces, and is made of a mixture comprising a first polymer and a second oligomer, the first polymer being at least one selected from the group consisting of poly(vinylidene fluoride-co-hexafluoropropylene) copolymers, polyvinylidenefluorides, polymethylmethacrylates, polyacrylonitriles, polyethyleneoxides, and celluloses having a polyether chain, the second oligomer being at least one selected from the group consisting of poly(ethylene oxide-co-ethylene carbonate) copolymers with at least one terminal groups substituted by a halogen atom and polyethyleneglycols with at least one terminal groups substituted by a halogen atom, and each of the first polymer and the second oligomer being present in the mixture in an amount capable of forming a single phase; and

an electrolyte present in the pores of the porous film and comprising the second oligomer and a lithium salt.

- [2] The solvent-free polymer electrolyte of claim 1, wherein the weight ratio of the first polymer to the second oligomer is in the range of 95:5 to 35:65.
- [3] The solvent-free polymer electrolyte of claim 1, wherein in the poly(ethylene oxide-co-ethylene carbonate) copolymer, the molar ratio of ethylene oxide unit to ethylene carbonate unit is in the range of 9:1 to 1:9.
- The solvent-free polymer electrolyte of claim 1, wherein the lithium salt is at least one selected from the group consisting of LiPF₆, LiBF₄, LiClO₄, LiCF₃SO₃, LiC₄F₉SO₃, LiN(CF₃SO₂)₂, LiAsF₆, and LiN(SO₂C₂F₅)₂.
- [5] The solvent-free polymer electrolyte of claim 1, wherein the porous film and/or the electrolyte further comprises an inorganic filler.
- The solvent-free polymer electrolyte of claim 5, wherein the inorganic filler is at least one selected from the group consisting of titanium dioxide (TiO₂), silicon dioxide (SiO₂), alumina (Al₂O₃), lithium aluminate (gamma -LiAlO₂), and zeolite.
- [7] A secondary battery comprising:
 an anode comprising a carbonaceous material;
 a cathode comprising a compound enabling intercalation and deintercalation of lithium; and
 a solvent-free polymer electrolyte interposed between the cathode and the anode,

wherein the solvent-free polymer electrolyte comprises:

WO 2005/081646 PCT/KR2005/000525

20

a porous film having a first surface and a second surface, the porous film comprises a reticulated network of channels formed between pores on the first and second surfaces, and is made of a mixture comprising a first polymer and a second oligomer, the first polymer being at least one selected from the group consisting of poly(vinylidene fluoride-co-hexafluoropropylene) copolymers, polyvinylidenefluorides, polymethylmethacrylates, polyacrylonitriles, polyethyleneoxides, and celluloses having a polyether chain, the second oligomer being at least one selected from the group consisting of poly(ethylene oxide-co-ethylene carbonate) copolymers with at least one terminal groups substituted by a halogen atom and polyethyleneglycols with at least one terminal groups substituted by a halogen atom, and each of the first polymer and the second oligomer being present in the mixture in an amount capable of forming a single phase; and

an electrolyte present in the pores of the porous film and comprising the second oligomer and a lithium salt.

- [8] The secondary battery of claim 7, wherein the weight ratio of the first polymer to the second oligomer is in the range of 95:5 to 35:65.
- [9] The secondary battery of claim 7, wherein in the poly(ethylene oxide-co-ethylene carbonate) copolymer, the molar ratio of ethylene oxide unit to ethylene carbonate unit is in the range of 9:1 to 1:9.
- [10] The secondary battery of claim 7, wherein the lithium salt is at least one selected from the group consisting of LiPF₆, LiBF₄, LiClO₄, LiCF₃SO₃, LiC₄F₉SO₃, LiN(CF₃SO₂)₂, LiAsF₆, and LiN(SO₂C₂F₅)₂.
- [11] The secondary battery of claim 7, wherein the porous film and/or the electrolyte further comprises an inorganic filler.
- [12] The secondary battery of claim 11, wherein the inorganic filler is at least one selected from the group consisting of titanium dioxide (TiO₂), silicon dioxide (SiO₂), alumina (Al₂O₃), lithium aluminate (gamma -LiAlO₂), and zeolite.
- [13] The secondary battery of claim 7, wherein the compound enabling intercalation and deintercalation of lithium is at least one selected from the group consisting of LiCoO₂, LiMnO₂, LiNiO₂, LiCrO₂, and LiMn₂O₄.